Hall Ticket No: | | | | | | | | | | | **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

B. Tech II Semester Regular Examinations May - 2016

(Regulations: R15)

MATHEMATICS FOR CIVIL ENGINEERS
(CIVIL)

Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. a) Verify Rolle's theorem for $(\boldsymbol{x+a})^{m}(\boldsymbol{x-b})^{n}$ where m,n are positive integers in [a,b] . (6M)

   b) Determine p such that the function f(z) = $\frac{1}{2}\,log_e\,\mathbf{x^2+y^2}$ + i $\mathbf{tan^{-1}}(\frac{px}{y})$ be an analytic function. (6M)

(or)

2. a) Prove that (if 0<a<b<1), $\frac{b-a}{\sqrt{(1-a^2)}} < \mathbf{sin^{-1}b - sin^{-1}a} < \frac{b-a}{\sqrt{(1-b^2)}}$. (6M)

   b) An electrostatic field in the xy-plane is given by the potential function $\emptyset = \boldsymbol{3x^2y - y^3}$ for the stream function. (6M)

UNIT – II

3. a) Evaluate $\int_{1-i}^{2+3i}(\mathbf{z^2+z})$ dz along the line joining the points (1, -1) and (2, 3). (6M)

   b) Find the Laurents' expansion of $\boldsymbol{f(z)} = \frac{7z-2}{(z+1)z(z-2)}$ in the region 1 < | z + 1| < 3. (6M)

(or)

4. a) If F($\boldsymbol{\zeta}$)= $\oint \frac{4z^2+z+5}{z-\zeta}\boldsymbol{dz}$, where C is the ellipse $(\frac{x}{2})^2 + (\frac{y}{3})^2 = 1$, find the value of F(3.5), F(i), $\boldsymbol{F''}$(-1) and $\boldsymbol{F''}$(-i). (6M)

   b) Determine the poles of the function $\boldsymbol{f(z)} = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole, Hence evaluate $\oint \boldsymbol{f(z)dz}$, where C is the circle |z| = 2.5 . (6M)

UNIT - III

5. a) Find a root of the equation $\boldsymbol{x^3 - 4x - 9 = 0}$, using the bisection method correct to three decimal places. (6M)

   b) Evaluate using Simpson's 1/3 rd rule , $\int_0^6 \frac{e^x}{1+x}\,dx$. (6M)

(or)

6. a) Find a real root of the equation $x log_{10}^{x} = 1.2$ by Regula-falsi method correct to four decimal places. (6M)

   b) Evaluate using Simpson's 1/3 rd rule , $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta}\ d\theta$ taking 9 ordinates. (6M)

UNIT - IV

7. a) Find an approximate value of y, when x=0.1, if $\frac{dy}{dx} = x - y^2$ and y = 1 at x = 0, using Picard's method. (6M)

   b) Using Runge-Kutta method of fourth order solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2, 0.4. (6M)

(or)

8. a) Solve $y' = x + y$ given y(1) = 0. Find y(1.1) and y(1.2) by Taylor's mothod. Compare the result with its exact value. (6M)

   b) Apply Milne's method to find a solution of differential equation $y' = x - y^2$ in the range $0 \leq x \leq 1$ for the boundary conditions y = 0 at x = 0. (6M)

UNIT – V

9. a) State and prove addition law of probability (6M)

   b) X is a normal variate with mean 30 and standard deviation 5, find the probability that (i) $26 \leq X \leq 40$ (ii) $X \geq 45$ (iii)$|X - 30| > 5$. (6M)

(or)

10. a) In a certain college, 4% of the boys and 1% of girls are taller than 1.8 m. Further more 60% of the students are girls. If a student is selected at random and is found to be taller than 1.8 m. What is the probability that the student is a girl. (6M)

    b) X is a Continuous random variable with probability density function given by

$$f(x) = kx (0 \leq x < 2)$$
$$= 2k (2 \leq x < 4)$$
$$= -kx + k (4 \leq x < 6)$$

    Find k and mean value of X. (6M)

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UNIT – I

1. a) Verify Lagrange's mean value theorem for $f(x) = log_e^x$ in [1,e] . (6M)

   b) Determine an analytic function whose real part is $\boldsymbol{e^{2x}(x\,cos2y - y\,sin2y)}$ (6M)

(or)

2. a) Verify Cauchy's mean value theorem for the functions $\mathbf{e^x}$ **and** $\mathbf{e^{-x}}$ in the interval (a,b). (6M)

   b) If $\boldsymbol{f(z)}$ is an analytic function of 'z',
   Prove that $\left\{\frac{\partial}{\partial x}\,|f(z)|\right\}^2 + \left\{\frac{\partial}{\partial x}\,|f(z)|\right\}^2 = |f'(z)|^2$. (6M)

UNIT - II

3. a) Evaluate, using Cauchy's integral formula, $\oint \frac{z}{z^2-3z+2}\,dz$, where C is |z-2| = $\frac{1}{2}$. (6M)

   b) Expand $\boldsymbol{f(z)} = \frac{1}{[(z-1)(z-2)]}$ in the region, (a) |z|<1, (b) 1< |z| < 2 . (6M)

(or)

4. a) Evaluate $\oint \frac{dz}{(z^2+4)^2}$, C : $|z - i| = 2$. (6M)

   b) State and prove residue theorem. (6M)

UNIT – III

5. a) Using Newton's iterative method, find the real root of $\boldsymbol{x log_{10}^x} = 1.2$ correct to four decimal places. (6M)

   b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's 3/8th rule taking h=1/6. (6M)

(or)

6. a) Develop a recurrence formula for finding $\sqrt{N}$, using Newton-Raphson method and hence compute to three decimal places $\sqrt{13}$. (6M)

   b) Use the Trapezoidal rule to estimate the integral $\int_0^2 e^{x^2}\ dx$ taking 10 intervals. (6M)

UNIT - IV

7. a) Using Euler's method, find an approximate value of y corresponding to x=1, given that dy/dx = x+y and y=1 when x=0. (6M)

   b) Apply Runge-Kutta fourth order method to find an approximate value of y when x=0.2 given that dy/dx = x+y and y=1 when x=0. (6M)

(or)

8. a) Apply Runge-Kutta method to find an approximate value of y for x = 0.2 in steps of 0.1, if $\frac{dy}{dx}$ = x + y^2, given that y = 1, where x = 0. (6M)

   b) Given 2 dy/dx = $(1+x^2)y^2$ and y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21, evaluate y(0.4) by Milne's predictor-corrector method. (6M)

UNIT – V

9. a) State and prove Baye's theorem. (6M)

   b) The following data are the number of seeds germinating out of 10 on damp filter paper for 80 sets of seeds. Fit a binomial distribution to these data: (6M)

x :	0	1	2	3	4	5	6	7	8	9	10
f :	6	20	28	12	8	6	0	0	0	0	0

(or)

10. a) A can hit a target 3 times in 5 shots; B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that (i) two shots hit, (ii) atleast two shots hit ? (6M)

    b) Fit a Poisson distribution to the set of observations : (6M)

x :	0	1	2	3	4
f :	122	60	15	2	1